Claims

1. An automatic fire detection method, based on the recognition of flames and/or smoke from the analysis of a sequence of images, the analysis being based on several image processing algorithms,

an algorithm comprising a step of comparing the frequency content of at least one image of said sequence with the frequency contents of a reference image in order to detect an attenuation of the high frequencies independently of the variations on the other portions of the image's spatial spectrum.

2. The method of claim 1, further comprising a step of adjusting the detection sensitivity of at least one of said algorithms can be adjusted through a graphical interface independently of the system's global sensitivity.

3. The method of claim 1, wherein said comparison is performed only in one or several portions of said image.

4. The method of claim 3, further comprising a step of dividing said image into several zones, said comparison being performed between at least one zone of said reference image and at least one comparable zone of at least one image of said sequence.

5. The method of claim 1, wherein the frequency contents of at least two chromatic components of said images of said sequence and of said reference image are calculated and used separately for said comparison.

6. The method of claim 1, wherein at least one said image processing algorithm is a smoke detection algorithm by measuring the saturation of colors in at least one portion of said images.

7. The method of claim 1, wherein at least one said image processing algorithm is an algorithm for detecting the disappearance of straight segments in at least one portion of said images.

8. The method of claim 1, wherein at least one said image processing algorithm is an algorithm for detecting flames.

9. The method of claim 8, wherein one said flame detection algorithm consists in analyzing the variations between consecutive images in order to detect objects whose outline oscillate with a frequency greater than 0.5 Hz.

10. The method of claim 8, wherein one said flame detection algorithm consists in identifying objects whose shape and color vary in a non-regular manner.

11. The method of claim 8, wherein one said flame detection algorithm consists in evaluating the color temperatures in at least a portion of said images in order to detect the presence of flames.

12. The method of claim 1, wherein at least one said image processing algorithm uses several image sequences representing the same view at different angles.

13. The method of claim 12, wherein said algorithm using several image sequences allows to supply information on the distance, the shape and/or the volume of the flames and of the smoke.

14. The method of claim 1, wherein at least one said image processing algorithm is an algorithm allowing the presence of a new object in a portion of the image to be detected.

15. The method of claim 14, wherein at least one flame or smoke detection algorithm is used in order to analyze in more detail the portion of the image where a new object has appeared.

16. The method of claim 1, wherein the temporal evolution of the results supplied by at least one of said algorithms is taken into account in the flame or smoke detection.

17. The method of claim 1, implemented by means of at least one video camera and a video digitization device connected to a computer in order to perform all the detection algorithms, and equipped with visualization means for a human operator.

18. The method of claim 1, implemented by a digital camera integrating the optic, the image sensor, the image digitization device, the processor for executing all the detection

algorithms and a communication interface for the detection results and/or visualization means for a human operator.

19. The method of claim 1, comprising a step of adjusting the sensitivity by means of an adjusting element allowing the flame detection sensitivity and the smoke detection sensitivity to be selected independently.

20. The method of claim 1, comprising a step of adjusting the sensitivity by means of an adjusting element allowing the detection sensitivity at each algorithm to be chosen independently from a plurality of used algorithms.

21. An automatic fire detection method, based on the recognition of flames and/or smoke from the analysis of a sequence of images, the analysis being based on at least two different image processing algorithms selected among the following algorithms:

a first algorithm comprising a step of comparing the frequency content of at least one image of said sequence with the frequency contents of a reference image in order to detect an attenuation of the high frequencies independently of the variations on the other portions of the image's spatial spectrum; and/or

a second algorithm comprising a step of detecting smoke by measuring the saturation of colors in at least one portion of said images; and/or

a third algorithm comprising a step of detecting the disappearance of straight segments in at least one portion of said images; and/or

a fourth algorithm comprising a step of analyzing the variations between consecutive images in order to detect objects whose outline oscillate with a frequency greater than 0.5 Hz; and/or

a fifth algorithm comprising a step of identifying objects whose shape and/or color vary in a non-regular manner; and/or

a sixth algorithm comprising a step of evaluating the color temperatures in at least a portion of said images in order to detect the presence of flames; and/or

a seventh algorithm comprising a step of using several image sequences representing the same view at different angles; and/or

an eighth algorithm comprising a step of detecting the presence of a new object in a portion of the image.

22. The method of claim 21, the analysis being based on at least three different image processing algorithms selected among said algorithms.

23. The method of claim 21, the analysis being based on at least four different image processing algorithms selected among said algorithms.

24. A device for processing digital images adapted to receive sequences of digital images coming from at least one video camera and comprising a computer program capable of executing the method of claim 1.

25. The device of claim 24, comprising visualization means for a human operator allowing said sequences of digital images to be visualized.

26. The device of claim 25, comprising alarm-generating means in order to generate an alarm displayed on said visualization means as soon as a fire has been detected, and means allowing a human operator to confirm or invalidate the presence of fire by visualizing said images.

27. A data carrier comprising a computer program directly loadable in the memory of a digital processing device and comprising computer code portions constituting means for executing the method of claim 1.